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PATENT APPLICATION

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IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Peter Mardilovich et al.

Confirmation No.: 5931

Application No.: 10/629,116

Examiner: LEE, Cynthia K.

Filing Date: July 28, 2003

Group Art Unit: 1795

Title: Fuel Cell Support Structure and Method of Manufacture

Mail Stop Appeal Brief - Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF REPLY BRIEF

Transmitted herewith is the Reply Brief with respect to the Examiner's Answer mailed on February 24, 2009 .

This Reply Brief is being filed pursuant to 37 CFR 1.193(b) within two months of the date of the Examiner's Answer.

(Note: Extensions of time are not allowed under 37 CFR 1.136(a))

(Note: Failure to file a Reply Brief will result in dismissal of the Appeal as to the claims made subject to an expressly stated new ground rejection.)

No fee is required for filing of this Reply Brief.

If any fees are required please charge Deposit Account 08-2025.

Respectfully submitted,

Peter Mardilovich et al.

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REPLY BRIEF

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Sir:

This is a Reply Brief under Rule 41.41 (37 C.F.R) in response to the Examiner's Answer of February 24, 2009 (the "Examiner's Answer" or the "Answer"). In Section 10, the Answer contains a response to some of the arguments made in Appellant's brief. Appellant now responds to the Examiner's Answer as follows.

Status of Claims

Claims 1-48 have been cancelled. Claims 49-84 are pending in the application.

As a result of the Appellant's Appeal Brief, filed November 20, 2008 ("Appellant's Appeal Brief"), claims 53 and 57 have been declared allowable by the Answer, and thus are not longer at issue in this appeal.

Claims 49-52, 54-56 and 58-84 remain finally rejected. Accordingly, Appellants appeal from the final rejection of claims 49-52, 54-56 and 58-84.

Grounds of Rejection to be Reviewed on Appeal

The recent Office Action raised the following grounds of rejection:

- (1) Claims 55 and 57 (actually 58) were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.
- (2) Claims 49, 50, 56, 58, 59, 65 and 66 were rejected as anticipated under 35 U.S.C. § 102(b) by U.S. Patent No. 3,503,808 to Agruss (“Agruss”).
- (3) Claims 49, 50-52, 55, 56, 58-61, 64, 70-72, 74, 75, 77-81, 83 and 84 were rejected as anticipated under 35 U.S.C. § 102(b) by U.S. Patent No. 5,234,722 to Ito (“Ito”).
- (4) Claims 58, 60-62, 64 and 67 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,482,792 to Faita (“Faita”).
- (5) Claim 76 was rejected as being unpatentable under 35 U.S.C. § 103(a) over the teachings of Ito in view of Hibino (of record).
- (6) Claim 73 was rejected as being unpatentable under 35 U.S.C. § 103(a) over the teachings of Ito in view of U.S. Patent No. 6,558,831 to Doshi (“Doshi”).
- (7) Claim 82 was rejected as being unpatentable under 35 U.S.C. § 103(a) over the teachings of Ito in view of Doshi.

Accordingly, Appellants hereby request review of these grounds of rejection.

One of the rejections made in the final Office Action in this case was withdrawn following the arguments in Appellant’s Appeal Brief. Thus, claims 49, 51-53, 55 and 57 are no longer rejected under 35 U.S.C. § 103(a) over the combined teachings of Faita and U.S. Patent No. 6,051,331 to Spear (“Spear”).

Argument

(1) Claims 55 and 58 comply with 35 U.S.C. § 112, second paragraph:

Appellant previously noted that the final Office Action states that claims 55 and 57 were rejected under § 112. However, the Action provides no discussion of claim 57, referring instead to claim 58. The Answer says nothing about this discrepancy, but continues to refer exclusively to claim 58. Consequently, Appellant continues to presume that the Examiner intended to reject claim 58 and not claim 57 under this heading.

Claim 55:

The Answer repeats the same argument and typographical error from the final Office Action that “claim 55 contracts [contradicts?] claim 49 from which it depends. It is unclear as to how pores that vary in diameter through a thickness of said substrate (claim 49) can be also ‘substantially uniform in size and shape’ (claim 55).” (Answer, p. 4). Appellant has noted in response that claim 55 clearly refers to the desired characteristic that each pore of the plurality of pores is substantially the same, i.e., uniform, in size and shape as the other pores. Each of the *uniform* pores varies in diameter through the thickness of the substrate, as claimed. This is illustrated in each of the figures in Appellant’s specification that show the plurality of pores. Consequently, there is no lack of clarity in claim 55 as erroneously alleged in the Action.

In response, the Answer holds that “the language ‘each of the uniform pores’ is not recited in the claim, and thus, the 35 USC 112, 2nd rejection is maintained.” (Answer, p. 11). Appellant never made any such argument.

Independent claim, claim 51, recites “a plurality of pores formed through said substrate, wherein said pores vary in diameter by tapering to a narrow point between two

openings, both openings being larger than said narrow point.” Claim 55 then states that “said pores are substantially uniform in size and shape.” Clearly, then, the “uniformity” claimed is that each of the plurality of pores is substantially the same in size and shape as the other pores. This is made inescapably clear in light of Appellant’s specification.

The Answer reaches its position only by insisting on finding a contradiction where, as explained above, none actually exists. It is contrary to the rules of claim construction to insist on a reading of the claim that produces an artificial contradiction when there is a more reasonable construction of the claim, supported by the specification, that avoids any such contradiction. Moreover, according to the MPEP, “[s]ome latitude in the manner of expression and the aptness of terms should be permitted even though the claim language is not as precise as the examiner might desire.” MPEP § 2173.02.

For at least these reasons, the rejection of claim 55 under § 112 should not be sustained.

Claim 58:

Claim 58 recites:

An apparatus comprising:
a fuel cell configured for providing power, said fuel cell comprising:
a support substrate supporting a solid cathode material deposited on a
first side of said substrate, a solid anode material deposited on a second side of
said substrate and an electrolyte; and
a plurality of pores formed through said substrate, said pores having a
size and shape formed in accordance with a pre-selected desired porosity.

According to the recent Answer, “[i]t is unclear to the Examiner as to what constitutes ‘pre-selected desired’ porosity.” (Answer, p. 4). Appellants respectfully submit that no actual basis for rejecting claim 58 under 35 U.S.C. § 112 is given in this statement. Moreover,

Appellants' specification clearly explains the concept of a "pre-selected desired porosity." (Appellants' specification, paragraph 0029).

The Answer also repeats the following argument from the final Office Action. "The Examiner notes that there is no structural difference between an electrolyte with a porosity that was determined before or during or after the manufacture." (Answer, p. 5). The Answer further argues "that 'pre-selected desired porosity' is a concept ... and does not structurally define the porosity." (Answer, p. 11). These statements are utterly unreasonable and clearly incorrect.

If one of skill in the art selects a desired porosity for an electrolyte *prior to manufacture* and adjusts the manufacturing variables to produce that desired porosity, of course the resulting electrolyte will be structurally different than if the porosity were not pre-selected and controlled in this manner. Consequently, the claimed "pre-selected desired porosity" must be given patentable weight because it inescapably produces a structural difference in the resulting product as opposed to allowing the porosity to develop at random, without pre-selection.

In any event, even the average reader, let alone one of skill in the art, would clearly understand what is meant by a "pre-selected desired porosity," i.e., a porosity selected prior to the formation of the electrolyte to produce desired qualities as described in Appellant's specification. Consequently, despite being unclear to the Examiner, claim 58 is not indefinite and is clearly explained and supported in Appellants' specification. Therefore, the rejection of claim 58 under 35 U.S.C. § 112, second paragraph, should not be sustained.

(2) Claims 49, 50, 56, 58, 59, 65 and 66 are Patentable over Agruss:

Claim 49:

Claim 49 recites:

A fuel cell comprising:
a ceramic support substrate supporting a cathode, anode and electrolyte; and
a plurality of pores formed through said substrate, *said pores having a size that varies in diameter through a thickness of said substrate.*
(Emphasis added).

In contrast, to claim 49, Agruss does not teach or suggest a fuel cell comprising a porous substrate, “said pores having a size that varies in diameter through a thickness of said substrate.” There is no teaching or suggestion in Agruss of this feature of claim 49.

In response, the Answer argues that “the Applicant has not refuted the Examiner’s position stated in the rejection that ‘the Examiner notes that pores formed of fused particles will not be uniform in shape. Due to the irregularity of the pores shapes and sizes, it is noted that the pores will vary in diameter through various cross sections of the Alundum substrate, thus varying in the thickness direction’.” (Answer, p. 12). This is pure speculation without absolutely no supporting evidence.

The Examiner mistakes where the burden of proof lies in this instances. *There is no support in the prior art or the evidentiary record for the position taken by the Examiner.* Consequently, there can be no burden on the Appellant to refute the Examiner’s position when that position fails to amount to a *prima facie* case of unpatentability.

The Examiner “notes” the pores taught by Agruss will not be “uniform in shape.” (*Id.*). The Examiner then concludes that such pores will vary in diameter as claimed. However, the Examiner provides absolutely no evidence to support this position. There are no citations to the prior art or other citation to support the Examiner’s speculation.

If the Examiner is attempting to rely on Official Notice in this instance, the Examiner has failed to satisfy the requirements of Official Notice. Under 37 CFR 1.104(d)(2) and MPEP § 2144.03, the Examiner must support any taking of Official Notice with an affidavit or other probative evidence, which the Examiner has never done.

Consequently, the Answer merely assumes that the claimed subject matter is present in the teachings of Agruss without any supporting evidence or rationale. This is clearly insufficient to support a rejection of Appellant's claims. "A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least these reasons, this rejection of claim 49 should not be sustained.

Claim 58:

Claim 58 recites:

An apparatus comprising:
a fuel cell configured for providing power, said fuel cell comprising:
a support substrate supporting *a solid cathode material* deposited on a
first side of said substrate, *a solid anode material* deposited on a second side of
said substrate and an electrolyte; and
a plurality of pores formed through said substrate, said pores having a
size and shape formed in accordance with a pre-selected desired porosity.
(Emphasis added).

In contrast, Agruss fails to teach or suggest the claimed porous substrate supporting a *solid* cathode material and a *solid* anode material. To the contrary, Agruss teaches away from this subject matter with a very different fuel cell chemistry in which the electrodes are *liquid* (*molten*). (Agruss, col. 2, lines 25-30). Clearly, one of skill in the art can tell the difference

between a solid electrode material, as claimed, and a liquid electrode material, as taught by Agruss.

According to the Answer, “claim 58 recites a solid cathode material and a solid anode material. It is noted that potassium and thallium are solid materials because at temperature 173 C or below, thallium is solid (3:5-15). Thus, when the fuel cell is starting up from room temperature to its operating temperature, the fuel cell of Agruss would read on the instant claim limitations of "a solid cathode material" and "a solid anode material", and not at its operating temperature. The Examiner notes that the *claim does not state that the electrode is solid at its operating temperature.*” (Answer, p. 12) (emphasis in original).

While the claim does not state that the electrode is solid at its operating temperature, the claim does recite “a solid *cathode* material” and “a solid *anode* material.” (Claim 58) (emphasis added). Thus, the solid *cathode* material must be able to serve as a cathode, and the solid *anode* material must be able to serve as an anode.

Appellant notes that the “solid” materials taught by Agruss do not function as electrodes, cathode or anode, but must be melted to liquid form before they become a cathode or anode. (Agruss, col. 2, lines 25-30). Consequently, Agruss clearly does not teach or suggest the claimed “solid *cathode* material” and “solid *anode* material.” The Answer simply ignores these recitations of the claim to arrive at an ineffective rejection. For at least this reason, the rejection of claims 58 and 59 should not be sustained.

Additionally, claim 58 recites “a plurality of pores formed through said substrate, said pores having a size and shape *formed in accordance with a pre-selected desired porosity.*” (Emphasis added). As noted herein, there is significant structural meaning attached to the recitation of pores having a size and shape formed in accordance with a pre-selected porosity. (See Sec. (1) above). In contrast, Agruss does not teach or suggest this subject matter.

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least these reasons, the rejection of claims 58 and 59 should not be sustained.

(3) Claims 49, 50-52, 55, 56, 58-61, 64, 70-72, 74, 75, 77-81, 83 and 84 are patentable over Ito:

Claim 49:

Claim 49 recites:

A fuel cell comprising:
a ceramic support substrate supporting a cathode, anode and electrolyte; and
a plurality of pores formed through said substrate, *said pores having a size that varies in diameter through a thickness of said substrate.*
(Emphasis added).

In contrast, Ito does not teach or suggest this subject matter. Ito does not teach or suggest a ceramic support substrate with pores formed through the substrate having a size that varies in diameter through the thickness of the substrate.

In this regard, the Answer has cited Figs. 1 and 2 of Ito. However, Ito states that "FIGS. 1 and 2 are scanning type electromicroscopic photographs showing the structure of the solid electrolyte films." (Ito, col. 3, lines 60-64). Thus, Figs. 1 and 2 show a surface of a solid electrolyte film that has undergone a heat treatment. (Ito, col. 4, lines 23-25). It is unreasonable to attempt to infer, as does the Answer, that these two-dimensional pictures of a *surface* teach "pores formed *through* said substrate." (Claim 49). There is no teaching or suggestion in Ito that any pores extend "through" the substrate as claimed. Consequently, Ito cannot teach or suggest the claimed "plurality of pores formed through said substrate" where

the pores also have “a size that varies in diameter through a thickness of said substrate.” (Claim 49).

Clearly, there is no reasonable basis on the record for reading into Ito the subject matter of claim 49, as the Office Action attempts to do. “A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least these reasons, this rejection of claim 49 should not be sustained.

Claim 51:

Claim 51 recites:

A fuel cell comprising:
a support substrate supporting a cathode, anode and electrolyte; and
a plurality of pores formed through said substrate,
wherein *said pores vary in diameter by tapering to a narrow point
between two openings, both openings being larger than said narrow point.*
(Emphasis added).

With regard to claim 51, the Action argues that Ito teaches “pores [that] vary in diameter by tapering to a narrow point between two openings both openings being larger than said narrow point. Refer to a portion of fig. 1 below.” (Answer, p. 7). As noted above, Figs. 1 and 2 of Ito show a *surface* of a solid electrolyte film that has undergone a heat treatment. (Ito, col. 4, lines 23-25) (emphasis added). It is impossible to conclude from Fig. 1 of Ito that the illustrated film includes pores with two openings as claimed. Moreover, there is no teaching or suggestion in Ito of any such subject matter. To the contrary, Ito refers to the pores as “closed.” (Ito, col. 4, line 29). This teachings away negates any speculation that the

Ito teaches pores having two openings. Thus, Ito clearly does not teach or suggest the claimed pore shape with two *openings*.

Moreover, Ito does not teach or suggest the claimed pore shape “tapering to a narrow point between such openings.” There is no evidence in the record that indicates that Ito teaches or suggest any such tapering between two openings. The Examiner is again trying to read teachings into Ito that simply are not there.

Clearly, there is no reasonable basis on the record for reading into Ito the subject matter of claim 51, as the Office Action attempts to do. “A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least these reasons, this rejection of claim 51 should not be sustained.

Claim 58:

Claim 58 recites:

An apparatus comprising:
a fuel cell configured for providing power, said fuel cell comprising:
a support substrate supporting a solid cathode material deposited on a first side of said substrate, a solid anode material deposited on a second side of said substrate and an electrolyte; and
a plurality of pores formed through said substrate, *said pores having a size and shape formed in accordance with a pre-selected desired porosity*.
(Emphasis added).

Ito does not teach or suggest the claimed “plurality of pores formed through said substrate, *said pores having a size and shape formed in accordance with a pre-selected*

desired porosity.” (Emphasis added). If weight is properly given to this recitation, for at least the reasons argued above, Ito clearly fails to teach or suggest all the features of claim 58.

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least these reasons, this rejection of claim 58 should not be sustained.

(4) Claims 58, 60-62, 64 and 67 are patentable over Faita:

Claim 58:

Claim 58 recites:

An apparatus comprising:
a fuel cell configured for providing power, said fuel cell comprising:
a support substrate supporting a solid cathode material deposited on a first side of said substrate, a solid anode material deposited on a second side of said substrate and an electrolyte; and
a plurality of pores formed through said substrate, *said pores having a size and shape formed in accordance with a pre-selected desired porosity.*
(Emphasis added).

In contrast, Faita utterly fails to teach or suggest this subject matter. According to the misguided Office Action, Faita “discloses [a] plurality of pores 2 or 9) and 3 (or 11) (fig. 2 and 3) formed through the bipolar plate or the gasket. These pores taper to a narrow point between the openings.” (Answer, p. 8). This is a complete misreading of what Faita teaches.

According to Faita, “the bipolar plate (1) is made of a metal plate which may have a flat surface in the area of contact with the collector (14). The peripheral frame area of the bipolar plate (1) is provided with holes (2) and optionally with distribution channels (3) for the inlet and outlet of the gasses.” (Faita, col. 5, lines 53-58). Thus, Faita teaches a bipolar

plate at the outside of an electrochemical cell (See Fig. 1) with holes for admitting gases to the enclosed electrochemical cell.

Consequently, the bipolar plate (1) of Faita to which the Action refers is clearly not “a support substrate supporting *a solid cathode material deposited on a first side of said substrate, a solid anode material deposited on a second side of said substrate* and an electrolyte,” as recited in claim 58. (Emphasis added). The Answer overlooks that the claim recites that the cathode and anode materials are deposited on respective sides of the claimed substrate. (Answer, p. 14). Thus, a frame outside of the electrochemical cell does not qualify as the claimed substrate with cathode and anode materials “deposited on” respective sides thereof.

Thus, Faita clearly fails to teach or suggest the subject matter of claim 58. “A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Faita of claim 58 and its dependent claims should be reconsidered and withdrawn.

(5) Claim 76 is patentable over Ito and Hibino:

This rejection is respectfully traversed for at least the same reasons given above in favor of independent claim 58. Therefore, this rejection of claim 76 should not be sustained.

(6) Claim 73 is patentable over Ito and Doshi:

This rejection is respectfully traversed for at least the same reasons given above in favor of independent claim 49. Therefore, this rejection of claim 73 should not be sustained.

(7) Claim 82 is patentable over Ito and Doshi:

This rejection is respectfully traversed for at least the same reasons given above in favor of independent claim 58. Therefore, this rejection of claim 82 should not be sustained.

In view of the foregoing, it is submitted that the final rejection of the pending claims is improper and should not be sustained. Therefore, a reversal of the Rejection of July 11, 2007 is respectfully requested.

Respectfully submitted,

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